ANDREW AINSLIE COMMON was born at Newcastle-on-Tyne on the 7th of August 1841. He was the son of Thomas Common, a well-known surgeon of the north, who gained celebrity by his treatment of cataract. The family is of Scottish border stock and came originally from Dumfriesshire, and the name Common is one of the many variants of Comyn.

While Dr. Common was still in infancy his father died, and the means of the family were straitened by pecuniary misfortunes. In consequence he had to go into the world to seek his living at an early age. He owed his attainments and position entirely to his own character and energy. He had to rely on himself, and no friend advised him in his course of study; it may be that these were contributory causes to the freshness and freedom from prejudice he brought to bear on his work.

He married in 1867, a few years after his association with his uncle in the firm of Matthew Hall & Co., of London, sanitary engineers, a firm which he conducted with success till 1890, when he practically retired from business.

Before he was ten years old he showed a constant interest in a telescope his mother borrowed for him from Dr. Bates, of Morpeth, but he had no opportunity for some years of following his inclination towards astronomical studies. In 1874 he set up in London a $5\frac{1}{2}$-inch refractor mounted equatorially, and made with it his first attempts at astronomical photography. Two years later he became a Fellow of the Royal Astronomical Society. About the same time he moved to Ealing, where he lived till his death in 1903.

He decided to improve his instrumental equipment, and obtained two glass discs of 17 inches diameter, with the intention of grinding a mirror and mounting a reflecting telescope. He, however, abandoned this idea and ordered an 18-inch silvered glass reflector from Calver. The mounting he designed and carried out himself. He commenced with this instrument, which was at the time a powerful one, in 1877, and in January 1878 he communicated to the Astronomical Society observations of the outer satellite of *Mars* and of the satellites of *Saturn*.

He was alive to the possibilities of photography in astronomy, and possibly the comparative slowness of the plates of that time was one reason which led him to obtain a larger reflector and to devote so much care to its mounting. In the *Monthly Notices* of April 1879 he has a "Note on Large Telescopes, with Suggestions for Mounting Reflectors." He carried these into practice shortly afterwards by obtaining a 36-inch mirror from Calver and mounting it in accordance with his own ideas. Particulars of the mounting are given in vol. xlvi. of the *Memoirs*. The mounting, which was a departure from recognised forms, showed great engineering skill, and particular attention may be drawn to the relief of the friction of the polar axis by partly floating it in mercury, and

to the plan projected but not carried out of electric control by the sidereal clock for very prolonged photographic exposures.

With the 3-foot reflector Dr. Common made visual observations of the satellites of *Mars* and *Saturn*, and the nebulæ in the *Pleiades*. He also obtained a photograph of Comet *b* 1881 on the 24th of June 1881, on the same night that it was photographed by Draper in America, the earliest successful photographs of a comet.

But Dr. Common's energy was mainly devoted to the photography of the *Orion* Nebula. His first attempt was on the 20th of January 1880, and was a total failure, but he patiently improved the driving of his clock and took advantage of each increase of sensitiveness in photographic plates till on the 17th of March 1882 he obtained a photograph "which excited the admiration of all the astronomers who had an opportunity of inspecting it." *

He still further perfected the guiding of his telescope, and obtained on the 30th of January 1883, with an exposure of 37 minutes, the splendid photograph with which all astronomers are familiar. Of the merits of this photograph he modestly remarked: "Although some of the finer details are lost in the enlargement, sufficient remains to show that we are approaching a time when photography will give us the means of recording, in its own inimitable way, the shape of a nebula and the relative brightness of the different parts in a better manner than the most careful hand-drawings."

The Gold Medal of the Society was awarded to him in 1884 for the great success which had attended his efforts in celestial photography.

Shortly after this Dr. Common sold his 3-foot telescope to Mr. Edward Crossley, of Halifax, who presented it later to the Lick Observatory. He took a year's rest from astronomy before commencing the great work of his life, the construction of his 5-foot reflector. Into this he put his whole heart, and devoted months and years of patient labour to the difficult task he had set himself. In the construction of his large mirror he had to face a number of unexpected problems and to put up with wearying disappointments. He overcame the difficulties by accurate observation of the effect of tiny and apparently quite trivial details, and by his perseverance in correcting and improving his work by the experience he gained. The Council reports of his Observatory for the years 1887–1892 are interesting records of his progress.

In February 1887 he reports that the year has been entirely devoted to the construction of the 5-foot reflector. The machine for grinding was completed in September 1886, and great progress made with the mirror. Permanent photographic records of the progressive state of the surface were obtained by

* Address by the President (E. J. Stone) on presenting the Gold Medal, *Monthly Notices*, vol. xliv. p. 211.

Foucault's test. The heavy work of the mounting was in hand. By February 1888 the mirror had been polished and figured several times. Evidence of internal strain in the glass was found, and, as it was uncertain to what extent this would affect the image, he contemplated ordering another disc. The mounting was in a forward state, the telescope tube being connected to the polar axis, which was a wrought-iron cylinder of 8 feet diameter, floating in a tank of water to relieve the friction. The reflector was practically completed in September 1888, and was ready for use in February 1889, but a slight ellipticity was found in the star images. It was accordingly refigured and resilvered in the spring of that year; the images were much improved, but at the same time a new disc was ordered. Between March 1890 and February 1891 the telescope was used on every available night, but, owing to unfavourable weather, very few nights were suitable for photography of nebulæ. Photographs of the *Orion*, *Dumb-bell*, *Pleiades*, and other nebulæ were obtained. The new 5-foot disc had been received, and such skill had Dr. Common acquired that while "it took two years of worry and anxiety to make the first mirror, the second disc was made into an almost perfect mirror in three months from the time it was first put on the machine."* A detailed account, full of interest, is given in the *Memoirs*, vol. I., "On the Construction of a Five-foot Equatorial Reflecting Telescope." This paper contains a description of the grinding machine, the manufacture of the tools for grinding and polishing, the methods of figuring and testing, of silvering, and of supporting the mirror, and of the equatorial mounting of the telescope. Of the performance of the 5-foot he says at the close of his paper: "As far as I am able to judge from the use of other mirrors of considerable size the gain has been maintained, and the power of the 5-foot over the 18-inch and the 3-foot is proportionate to the size. On nebulæ this is seen to great advantage, both visually and photographically. Such an object as *Mimas*, which the 18-inch would, under the most favourable circumstances, just render visible and the 3-foot show fairly well, can with the 5-foot be seen close to the end of the ring, and away from it could not be overlooked." The pleasure he derived from the construction of his mirror may be gathered from a sentence in his address when chairman of the Astronomical Section of the British Association in 1900: "The invention of the telescope is to me the most beautiful ever made. Familiarity both in making and in using has only increased my admiration."

Owing to various causes very little use was made of the telescope. A few excellent experimental photographs were taken. One night, while using the instrument as a Newtonian

* The actual time of work was from the 25th of March 1891 to the 24th of June. The machine was in use for 273½ hours, and at 25 strokes a minute this gives 410,250 strokes to make a flat disc into a nearly perfect mirror.—*Memoirs*, vol. I. p. 147.

reflector, he narrowly escaped a fall from the high staging. This decided him to devise, if possible, means of working the telescope from the eye end. The difficulty and risk of boring a hole in the centre of the 5-foot led him to attempt a modification of Cassegrain's form, the second mirror being inclined, so that the image should be clear of the large mirror, but the results, though promising at first, were not satisfactory. No further observations were made with the instrument, as Dr. Common's energies were about this time diverted to new problems in connection with gun-sights and telescopes for the army and navy. In this field his great knowledge of optics and practical skill were happily combined and very successful results obtained, to the great benefit of the country. He was engaged in this work to the time of his death. As regards its national importance the following words of Captain Percy Scott, R.N., spoken at a dinner at the Savage Club on 22nd of November 1902, may be put on record here. He said "that the nation owed a deep debt of gratitude to Dr. Common for the great improvements that he had made in gun-sights. It mattered not how good the gun was, nor how good a man there was behind it; unless the sight was perfect good firing could not be made. The great stride by the British Navy lately in that direction was entirely due to Dr. Common. . . . He had produced a telescope gun-sight which would, when properly used, quadruple the fighting efficiency of our battle-ships."

In the manufacture of this 5-foot reflector Common acquired so intimate an acquaintance with the mechanical properties of glass that the grinding and figuring of smaller mirrors became a matter of ease. In connection with the peculiar difficulties of constructing flat mirrors he devised a specially sensitive form of spherometer. He was extremely generous both with his time and money, and when a mirror was wanted for astronomical work Dr. Common invariably undertook to supply one. For the eclipse of 1889 he made two mirrors of 20 inches aperture and 4·5 inches focus, presenting them to the Royal Society. He made a 30-inch mirror for the Solar Physics Observatory. When Sir Henry Thompson presented an equatorial to the Royal Observatory Dr. Common generously supervised the construction of the 30-inch mirror carried on one side of the declination axis. In 1900 he presented a beautiful flat mirror of 20 inches to the National Physical Laboratory.

The 16-inch cœlostats which Dr. Common designed and made for the Eclipse Expeditions of 1896 bear witness to his mechanical as well as to his optical skill. Attention was directed by M. Lippmann to the fact that there would be no movement in the sky reflected by a mirror which turned at half the Earth's rate about an axis parallel to itself and passing through the pole. The advantages of this arrangement for eclipse photography were further enforced in England by Dr. Stoney and Professor Turner. Dr. Common immediately offered to make such an instrument and

have it tried. The beautiful instrument in which he embodied what was till then merely an interesting geometrical property seems now almost indispensable for eclipse work.

The interest he took in developing new forms of astronomical instruments may be illustrated by the Sheepshanks telescope of the Cambridge University, to which he presented a 16-inch flat mirror, in order that the polar siderostat form of instrument might be tried. The Durham Almucantar is another instrument in which the design was largely indebted to the engineering skill of Dr. Common, whose assistance was gratefully acknowledged by Professor Sampson.

He attended the conferences at which the Astrographic Chart was organised, and though he had shown what could be done with reflectors he unhesitatingly recognised the advantages possessed by refractors for this work, and had great admiration for the beautiful results attained by the brothers Henry. At the conference of 1887 he and M. Janssen were appointed a committee for dealing with astronomical photography outside the work of the Chart.

He was interested in eclipse work, and allowed his observer, Mr. Taylor, to go to the eclipse of December 1889 rather than have a station unoccupied, though Mr. Taylor's assistance had only just been obtained for help with the new 5-foot mirror. He himself went to Norway in 1896 to observe the eclipse of that year, but had cloudy weather.

He joined the Society in 1876, and was elected on the Council in 1879. He received the Gold Medal in 1884. He was treasurer of the Society from 1884 to 1895, and President in 1895 and 1896. He was elected a Fellow of the Royal Society in 1885, and served on its Council from 1893 to 1895. From 1894 he was one of the representatives of the Royal Society on the Board of Visitors of the Royal Observatory, Greenwich. In 1891 the honorary degree of LL.D. was conferred on him by the University of St. Andrew's. In 1900 he was chairman of the Section of Astronomy at the British Association, when he delivered an address on the development of astronomical instruments and the application of photography to astronomy.

He died suddenly on 2nd of June 1903, from heart failure, while at work in his study. He leaves a widow, one son, and three daughters.

The energy he threw into his work and the pleasure his successful results gave him have been already referred to. There was in his character an absence of self-seeking and a disposition to work for the general good of astronomy. He had his reward in the esteem and regard of his fellow astronomers.

F. W. D.

[The Council are indebted to Mr. Drower for some particulars of Dr. Common's life, and also to a notice published by the Royal Society.]